

REVIEW ARTICLE

Assistive Technology (AT) Landscape in India: The Story so far and Road Ahead

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ABSTRACT

The importance of Assistive technology (AT) is gaining serious attention worldwide due to recent technological advancements, an aging population, and the rising prevalence of non-communicable diseases (NCDs) and functional impairments. Global reports on AT reveal that one in every three globally requires at least one AT and this need is further exacerbated by age, region and socioeconomic status, making individuals belonging to LMICs the most vulnerable. The preliminary findings of the ICMR-initiated rATA survey, currently underway across India, reveal a significant gap between AT needs and AT access, with females, older age groups, and individuals from rural and tribal areas being the most vulnerable. Although there have been significant innovations in the field of AT with the advent of Artificial Intelligence (AI) and machine learning (ML), affordability, accessibility and limited customisations as per user needs hinder the wider adoption of AT, especially in India, with a vast population, diverse cultural and geographical landscapes and limited awareness about AT services and products. Indian government initiatives such as the RPwD Act, ADIP and RVY schemes, intended at provisioning AT services for eligible individuals which includes persons with disabilities (PwDs) and individuals above 60 years, have substantially failed to deliver as promised mainly due to inadequate financial allocations, poor distribution and supply chain networks, weak regulatory enforcements and limited awareness of schemes among the targeted beneficiaries. In this regard, this article attempts to provide a comprehensive overview of the current situation of AT in India, focusing on government initiatives and schemes, current demand and scope for AT, barriers in AT adoption and finally recommendations and best practices for a successful AT adoption in India.

KEYWORDS

Assistive Technology, Functional Impairments, Unmet Needs, Accessibility, User-centric Design

INTRODUCTION

The term Assistive Technology (AT) encompasses services and devices that assist individuals with any form of disability or functional impairment in order to sustain their

daily activities with ease and also in a dignified manner (1). The need for AT is hallmarked by the World Health Organization (WHO) Global Report on Assistive Technology (GReAT) which estimates that globally, around two and half

billion people are expected to be in need of at least one assistive product, with predictions likely to escalate to three and half billion people by 2050 given the rise in older age population and non-communicable disease (NCD) prevalence (2). However, around one billion people worldwide still lack access to AT that they need, with access gaps predominant in low- and middle-income countries (LMICs) (2).

India with a huge population of over 1.5 billion, faces a serious challenge in AT access. The 2011 Census report of India reveals that around 2.21% of the population has some form of disability (3). However, this might be an underestimated figure according to global surveys and WHO reports, which predict a greater prevalence of functional difficulties when older age population, individuals with chronic health conditions and those with temporary impairments are also considered (2). One of the key drivers for AT demand is the demographic transitioning towards an old-age population, and studies report that approximately 8.6% of the Indian population is aged 60 years and above which equals around 120 million and is likely to double in the coming decades (3).

The disability distribution pattern in India is similar to global trends with vision, hearing and loco-motor impairments being the most common, followed by cognitive, communication and self-care impairments, with the latter three impairments slowly posing concerns at a global level (4). The unmet needs for AT in India is largely due to the rural urban disparities, with around 68% of population residing in rural areas posing limited access to AT related services, training personnel and repair centers (5). The Indian Council of Medical Research (ICMR) supported rapid Assistive Technology Assessment (rATA) survey findings reveals that AT unmet needs are predominant in rural, remote and tribal areas with female and older aged individuals being the most vulnerable (6).

Although, India has potential opportunities for AT innovation at scale with locally manufactured devices, open-source software solutions and growing public-private partnerships (PPPs) to enhance AT access,

there exists systemic challenges in terms of AT affordability and availability, poor supply-chain networks, weak regulatory enforcement that halt the AT progress significantly (2,5). One way to address these challenges is by integrating AT into the domains of health, education and social welfare, while simultaneously investing in local manufacturing of AT devices with an innovative, inclusive and user-centered design (7).

This review attempts to give an in-depth overview of the AT landscape in India with a special focus on the policy frameworks and government initiatives on AT, current scope and demand for AT, available AT solutions in the Indian market, barriers for AT adoption and recommendations and best practices for improving AT adoption and accessibility.

MATERIAL & METHODS

A structured literature review was employed on the subject of "assistive technology in India". The search strategy considered both academic and non-academic sources to provide a comprehensive understanding of AT in the Indian context. A thorough search was conducted in PubMed, Scopus, and Google Scholar using terms such as "assistive technology", "assistive products", "accessibility devices", "disability aids", "India", and "health policy". Government reports, policy briefs, and publications from international agencies such as WHO and UNICEF were also reviewed, along with grey literature containing market reports and media perspectives on the recent trends in AT developments.

Sources were eligible if they were published between 2010 and 2025 in English and relevant to the Indian context, either in policy frameworks or aspects related to AT access, AT solutions, and AT barriers. Studies without any relevance to India and primarily focusing on the technical engineering aspects of AT manufacturing were excluded. Titles and abstracts were meticulously screened for relevance, followed by an in-depth review where necessary. Data was extracted in the domains of AT spectrum, target populations, policy frameworks, AT barriers, accessibility

challenges, and AT innovation. Findings were synthesised and organised into key themes that best narrate the current AT landscape in India.

This review is subject to a few limitations. Firstly, grey literature sources, although reveal valuable insights into the Indian AT market, may be subject to relevancy and reliability in light of economic and technological changes. Secondly, although efforts were made to create a comprehensive list of all current AT manufacturers, emerging AT startups and accelerators in India, a few exclusions were made due to the unavailability of relevant

data. These limitations were considered during synthesis, and findings should be interpreted with these cautions in consideration.

RESULTS & DISCUSSION

Policy Frameworks and Government Initiatives on AT

The Indian government has enacted several schemes and initiatives to promote AT access and to enhance the well-being of Persons with disabilities (PwDs). Table 1 depicts the Indian government's initiatives and schemes in the field of AT over the years.

Table 1: List of Indian government initiatives in the field of AT

Govt Initiative/ Scheme/Act	Year	Key Objectives	Strengths/ Benefits	Challenges/ Limitations
ADIP Scheme (Assistance to Disabled Persons for Purchase/Fitting of Aids/Appliances) (8)	1981	To provide financial assistance to PwDs for procuring durable, modern, and standard assistive devices/aids.	<p>1. Direct Financial Aid: Significantly reduces the cost barrier for essential devices.</p> <p>2. Wide Coverage: Utilizes a vast network of implementing agencies (ALIMCO, NGOs).</p>	<p>1. Service Gaps: Often lacks comprehensive post-fitting care, maintenance, and user training.</p> <p>2. Bureaucracy: The application and approval process can be lengthy.</p>
Rights of Persons with Disabilities (RPwD) Act (9)	2016	To enforce a rights-based approach; mandate R&D for AT; and ensure universal accessibility and reasonable accommodation.	<p>1. Legal Mandate: Makes access to AT and accessibility a legally enforceable right.</p> <p>2. Digital Focus: Legally mandates accessibility in Information and Communication Technology (ICT).</p>	<p>1. Implementation Gaps: Slow execution and insufficient financial allocation at the State level to meet mandates.</p> <p>2. Enforcement Issues: Difficult to enforce "reasonable accommodation" consistently.</p>
Accessible India Campaign (<i>Sugamya Bharat Abhiyan</i>) (10)	2016	To create a barrier-free environment across the Built Environment, Transportation, and ICT.	<p>1. Systemic Change: Drives holistic, systemic removal of environmental barriers, making AT use effective.</p> <p>2. Measurable Goals: Time-bound goals for achieving accessibility benchmarks across public infrastructure.</p>	<p>1. Retrofitting Challenge: Massive logistical and financial challenge in making all existing infrastructure fully compliant.</p> <p>2. Inconsistent Compliance: Varies widely across different states and sectors.</p>
Rashtriya Vayoshri Yojana (RVY) (11)	2017	To provide free physical aids and assisted-living devices to economically weaker senior citizens (60+) suffering from age-related infirmities.	<p>1. Specific Target Group: Directly addresses the needs of the poor and disabled elderly population.</p> <p>2. Free of Cost: Devices (e.g., dentures, hearing aids) are provided entirely free.</p>	<p>1. Awareness Gap: Limited awareness of the scheme's existence among the targeted beneficiaries.</p> <p>2. Camp Model: The camp-based distribution can pose accessibility challenges for the frail elderly in remote areas.</p>

National List of Essential Assistive Products (NLEAP) (12)	2023	A prioritized list of essential AT developed to standardize and rationalize the provision of aids across all government schemes and healthcare programs.	<p>1. Standardisation: Ensuring schemes like ADIP and RVY provide quality assistive products of high standards</p> <p>2. Policy Reference: Acts as a middleman between policy makers and private manufacturers to prioritize essential ATs.</p>	<p>1. Not a Scheme: No direct funding mechanism, Impact relies largely on successful adoption of the list via already existing funds</p> <p>2. Dynamic Updates: Needs continuous review to keep pace with rapid advancements in global AT innovation.</p>
Assistive Technology (Standards and Accessibility) Rules (13)	2025	Mandates all AT (devices, software, systems) for public use must conform to prescribed BIS standards and require certification to ensure quality and safety.	<p>1. Quality Assurance: Addresses a major gap by ensuring AT is safe, durable, and effective, increasing user trust.</p> <p>2. Procurement Reform: Ensures that government procurement sources only from certified manufacturers.</p>	<p>1. Regulatory Burden: May increase costs for small domestic manufacturers due to compliance requirements.</p> <p>2. Implementation Capacity: Requires establishing a robust, independent national certification and monitoring infrastructure.</p>

Current Scope and Demand for AT

As mentioned earlier, the demand for AT in India is expected to be increasing in the coming years as more people become old and NCDs prevalence also likely to increase. One of the largest areas for AT demand is in the locomotors as more than twenty million Indians suffer with physical disabilities in addition to millions with age-related chronic mobility impairments (14). Mobility devices like wheelchairs, walkers, tricycles, crutches are essential but customization as per user needs and geographical terrains is currently limited given India's diverse geographical landscapes and built environments (15,16).

The AT demand is also driven by the burden of visual impairments given that India has the highest proportion of people suffering with visual disabilities across the globe (17). Apart from the traditional visual aids such as white canes and braille, significant interests lies in users opting for advanced devices and solutions like screen readers, smart canes, AI-powered mobile applications and smart glasses (18). Such interests are mainly driven by the rapid digitization of our everyday lives dominated by smart mobiles and devices with huge markets locally and internationally.

In India, around 63 million people are estimated to be suffering with hearing

impairments with rising prevalence among children and older adults (19). Although hearing aids and concealer implants prevail in the market, high costs in purchase and maintenance is hindering their usage compounded by limited public awareness and social stigma associated with using the device (20).

Although, cognitive and communication impairments have low prevalence rates in India, they are now being recognized as areas of concern due to a growing notion of health equity at a global level (2). Alternative communication (AAC) tools and specialized learning aids are suitable for children diagnosed with autism, down syndrome and other neurological disorders, and for older adults suffering with dementia but their availability is limited in India, and pose high costs for importing with limited adaptability to the Indian settings (21,22).

The domain of self-care aids includes commode chairs, fall detectors, adaptive kitchenware and incontinence products apart from others, although these devices warrant safety and dignity and benefit the older adults, their wide-scale adoption is underway and hindered by social stigma, limited market availability and poor distribution networks especially in rural areas (23).

Available AT Solutions in the Indian Market

The AT market in India was valued at 2.4 billion USD in 2024, at a Compound Annual Growth Rate (CAGR) of 3.7% escalating further to 3.5 billion USD by 2033. Mobility aids alone was worth 395 million USD in 2024 and is expected to double by 2033 followed by hearing aids valuing at 4.2 billion USD including imports. All in all there is a huge potential and scope for AT market growth fueled by AT demand and technological innovation (15,20).

Table 2: Leading AT Manufacturers and Startups in India (24,25,26)

Domestic Players

ALIMCO: The largest government manufacturer, specializing in prosthetics, orthosis, wheelchairs, hearing aids, and mobility aids.

Wings Bionic: Myoelectric hand prosthesis with advanced bionic interfaces.

DeeDee Labs: ProGrasp bionic prosthesis, lightweight and user-friendly.

NeoMotion: Customizable powered and manual wheelchairs.

Sixdots Design: Affordably priced multi-line Braille devices.

SunQulp Tech: SmartVest navigation aid.

Ktwo Healthcare: Clinical service delivery of prosthetics, orthosis, wheelchairs.

Phono Logix, Trestle Labs, TorchIt, Thinkerbell Labs, Vembi Technologies, Raised Line Foundation: Focus on visual and communication AT, digital content, and smart mobility aids.

International Players

Phonak, Oticon, Signia, Widex, Starkey: Hearing Aids

Orbit Research, HumanWare: Braille Devices

Envision, OrCam: AI Glasses

Startup Ecosystems in AT

Accelerators and incubators: AssisTech Foundation, BIRAC-Social Alpha Quest, Atal Innovation Centres, and various IITs/AIIMS.

Government: State-of-the-art manufacturing upgrades in ALIMCO, MoUs with research institutions, hackathons, and public procurement for both essential and emerging technologies.

Barriers to AT Adoption

Even though, AT has a huge market value in terms of reach and demand, there exists significant systemic barriers that hinder the progress. Unable to afford the AT services and devices is the most important barrier to AT access within the country (23). Devices such as

hearing aids (price range: 6,000 to 70,000 INR), smart canes (price range: 3,500 to 5,000 INR) and braille devices (price range: 30,000 to 2,00,000 INR) are far from reach to the common man due to their high costs in purchase, maintenance and software upgradation (20). The GReAT report highlights that around one billion people worldwide do not have an AT of their need mainly due to affordability issues and within LMICs, only 3% of the population in need for AT are able to obtain the AT products or services (2).

Another barrier for AT adoption is a fragmented supply-chain networks for AT products and services that are largely in favor of the urban niche leaving the rural deprived (6). Grey markets prevail as a consequence of poor regulatory enforcement and a lack of timely provisions of AT services and products from the government forcing the people in need of AT to purchase the low-quality or faulty products with limited after-sales support (27) and limited warranty affecting the low levels of user satisfaction. AT distribution channels also handle in a complex manner with government-run camps for functional needs assessment, while AT provisions outsourcing to NGOs complicating the service delivery especially in rural and remote settings (1).

Lack of training and awareness regarding AT usage also poses a barrier. As most of the government and private AT service centers, training staff and distributors are located within urban areas, people from rural areas are less likely to utilize these services due to functional limitations, logistic challenges and affordability creating an AT access gap across the country (18, 23). The GReAT report highlights a lack of well trained and qualified AT specialists including rehabilitation specialists, therapists and technicians especially in LMICs , coupled by limited systematic training and awareness leaving the AT user and AT trainer in silos.

Language, content and use of digital AT devices face challenges as Indians speak diversified languages but most of the AT software solutions are predominantly in English or foreign language which Indians are not well versed with resulting in poor understanding of the digital device due to limited digital as well

as language literacy especially in rural and tribal areas (6, 23).

Finally, government initiated schemes and policies around AT have not fully equipped for wide-scale AT adoption due to systemic challenges and poor integration of AT into health insurance schemes (28). The AT 2030 programme survey of 20 countries found wide gap in AT access rates ranging between 3% to

90%, emphasizing the need for a strong policy frameworks and inter-sectoral coordination in delivering the outcomes (2). Although India strives to adhere to the international frameworks set forth by WHO and Global Cooperation on Assistive Technology (GATE) for AT adoption, recognizing the country-specific challenges and addressing them locally is key for wide-scale AT adoption.

Table 3: Summary of Key Policy Initiatives, Available Technologies, and Adoption Challenges of AT in India

Aspect	Key Initiatives/ Available AT	Barriers/Challenges
Policy & Standards	RPwD Act, AT (Standards & Accessibility) Rules, BIS product standards, NLEAP, Accessible India Campaign, ADIP	Fragmented enforcement, slow uptake of new standards, lack of public awareness
Procurement & Distribution	ADIP, RVY, Thiran platform, digitized applications, GeM-based procurement	Eligibility, documentation complexity, rural logistics, slow grievance redressal
Financial support	Full subsidy for low-income users, insurance pilots, reimbursement models, local manufacturing emphasis	High out-of-pocket expenses for non-eligible individuals, reimbursements do not cover device maintenance costs
Mobility devices	ALIMCO, NeoMotion, Exobot, Sixdots Design (Braille), Trestle Labs (Kibo)	Costs of advanced aids, low customization for Indian contexts, urban bias
Visual Aids	SmartCane, Orbit Reader, Thinkerbell Annie, Kibo, Smarton Glasses, Braille books	Affordability, regional language support, access to training, repair services
Hearing Aids/ Cochlear Implants	ALIMCO, Phonak, Oticon, Starkey, BTE (Behind-the-Ear) /ITE (In-the-Ear) /CIC (Completely-In-Canal) hearing aids, cochlear implant program	Stigma, device fitting services, repair, affordability
Communication/ Cognitive	Limited local AAC (Augmentative and Alternative Communication) devices, imported apps/devices, Phono Logix	Lack of localized solutions, low public awareness, high cost
Education/Skills	ICT (Information Communication Technology) based content, tactile books, inclusive schools, National Education Policy 2020	Gaps in content availability, classrooms still face inaccessibility at public schools and colleges
Distribution Channel	ALIMCO, CRCs (Composite Regional Centres), online portals, state-run platforms, NGO networks	Poor rural outreach, inventory management, limited after-sales/repair infrastructure
User Training/ Awareness	AT literacy camps, wheelchair skills labs (NCAHT, IIT Madras), peer training	Limited structured programs, weak rural/grassroots engagement
Innovation & R&D	Start-up accelerators (AssisTech Foundation, Social Alpha, BIRAC), collaborations (IITs, AIIMS, ICMR)	Weak investment climate, slow regulatory approvals, scaling-up challenges

CONCLUSION

India stands at a crucial juncture in ensuring fair and equitable access to AT for all those in need. While, comprehensive policy frameworks, NLEAP list, localization of AT production, and innovative product development hubs prioritising inclusive user-

centric design are paving the path to AT adoption, there exists significant AT access gaps in terms of financial allocations, social support, infrastructure, knowledge, and awareness of AT products and services with regional and gender inequities further

exacerbating the gaps and thus calls for necessary and evidence-based solutions.

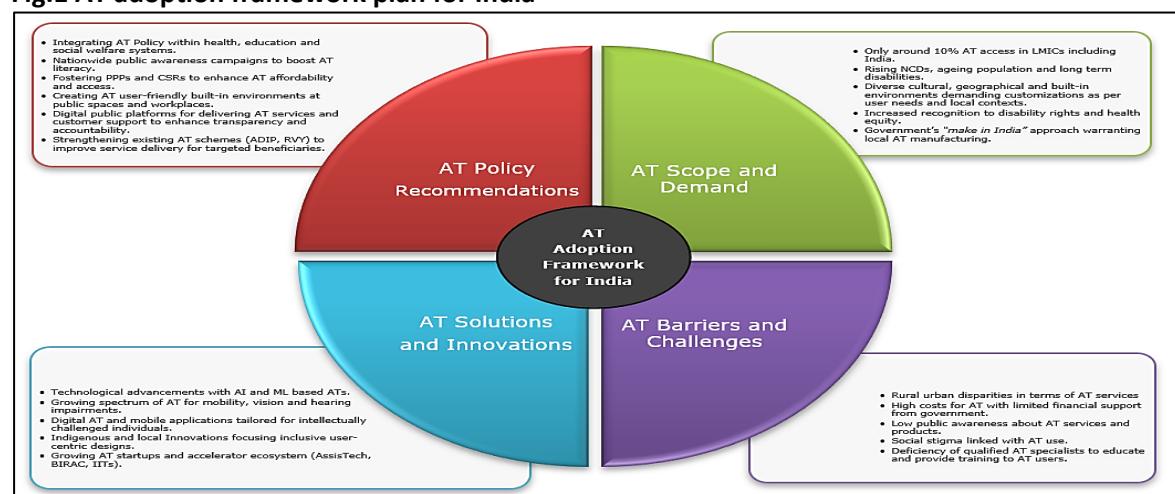
One of the key challenges is in acknowledging the paradigm shift in AT provision, duly moving from a charity-based, social support-driven, subsidy model to a rights-based, sustainable model grounded in health, education, and social welfare systems (35). This move requires collaboration among the government, AT manufacturers, civil society, and global AT partners. In light of the emerging technological advancements boosting AT innovations and collaborations ahead, India could lead the way in AT adoption and serve as a model for other LMICs facing similar demographic changes and health care disparities.

Finally, bridging the AT accessibility gap in India would not only improve the livelihoods of those in need but also uphold the vision of an inclusive, productive, and sustainable nation, uplifting and standing for the rights of individuals with disabilities and functional impairments.

RECOMMENDATION

For a successful AT adoption in India, it is essential to simultaneously address the systemic, financial, social and technological barriers. Integrating AT within the departments of health, education, and social welfare helps in creating a holistic environment for AT users (23) while also aligning with the notion of Universal Health Coverage (UHC). Incorporating AT into the agendas of the National Health Mission (NHM), National Programme for Healthcare of the Elderly (NPHCE) and National Education Policy

Fig.1 AT adoption framework plan for India



(NEP) 2020 would mandates that AT access is not just a social welfare provision but a fundamental right upholding the well-being of all those in need (29).

Digital platforms for AT services such as Tamil Nadu government's *Thiran* portal (30) and central government's ADIP portal provides a transparent mode of dealing with AT users database, AT related procurements, distributions and supply-chain networks while also offering user support thorough dedicated helplines or chatbots for timely resolution of user queries with AT services and products. It is noteworthy to acknowledge that AT users' engagement and input are vital in understanding the ground realities regarding assistive product functionality and efficiency while also builds mutual trust between manufacturers and AT users ultimately catering the user needs prioritising an inclusive, user-centric AT design. The NLEAP list developed by ICMR should undergo timely revisions in accordance to the global AT innovations and in adherence to the standards given by International Organization for Standardization (ISO) and World Trade Organization (WTO) for developing assistive products of high standards and quality (31,32). Additionally, government should emphasize on performing frequent regulatory audits to the manufacturing hubs and local AT markets to identify high priced low-quality counterfeit assistive products that may not cater to the needs of the user and also to control the distribution of such products across the country.

Government aided financial provisions for AT should not be limited to covering the AT procurement costs but duly extend to cover the expenses related to repair, replacement, upgradation and training of AT services and products. Innovative models such as AT rental schemes and community-pooled microfinance may improve AT access especially for low-income and vulnerable populations. Tax exemptions for imported assistive products would further benefit the AT users substantially.

Local manufacturing as popularised by the “*Make in India*” approach, should duly apply in the field of AT by fostering innovative research and supporting Micro Small and Medium Enterprises (MSMEs), local startups, and think tanks focusing on AT innovation at scale. PPPs and Corporate Social Responsibility (CSR) can fund local accelerators and product development hubs as evidenced by the National Centre for Assistive Health Technology (NCAHT) at IIM Madras and AssisTech Foundation (24-25,33). Public access to open-source software boosts AT developers to create AT solutions customised to the local contexts and user needs and moreover, conducting live interactive sessions on AT product demonstrations may spark interest among the public to trial the product thus providing instant and necessary feedbacks to the AT developers and manufacturers.

Addressing the AT literacy gap is a key challenge in India due to diverse cultural and ethnic backgrounds. Government should focus on conducting AT public awareness campaigns within the community by partnering with local ASHAs and community heads. Emphasis should be given using local language for better understanding of the benefits of AT and also to remove the social stigma linked with AT usage (34). Further, the concepts of AT should be integrated into the training curricula of medicine, nursing and teaching to build professionals, better equipped with relevant knowledge and skills in addressing AT related challenges.

In lieu of the novel innovations in the field of digital accessibility, efforts should be made in developing an inclusive digital ecosystem

complying with accessibility standards such as the Web Content Accessibility Guidelines (WCAG). Additionally, it is essential to invest in upgrading all public digital platforms with user-friendly accessibility features like optical character recognition (OCR), text-to-speech, and voice assistants based on Indian languages to enhance usability and accessibility.

Lastly, for government to act in a evidence based manner, it is vital to understand the population's functional needs and barriers to AT access, therefore, periodic nationwide surveys have to be undertaken using the WHO rATA tool, alongside longitudinal studies on AT user satisfaction and socioeconomic impact, for generating robust evidence that could inform and enable policymakers and private AT manufacturers to make evidence-based strategic decisions on fostering a wider AT adoption across the country (see fig.1).

AUTHORS CONTRIBUTION

All authors have contributed equally.

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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